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[CHD 8: Occupational Safety, Health and Chemical Hazards]

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Indian Standard
CODE OF SAFETY FOR METHYL ETHYL KETONE

UDC 661·727·6 : 614·878

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *April* 1988

AMENDMENT NO. 1 DECEMBER 2006
TO
IS 12141 : 1987 CODE OF SAFETY FOR METHYL ETHYL KETONE

(*Page* 4, *clause* **3.3.1**) — Insert the following at the end

'Methyl ethyl ketone reacts with oxidizing agents, strong acids mixtures of strong bases and chlorinated solvents and potassium *t*-butoxide.'

(*Page* 8, *clause* **9.2.1**) — Insert the following at the end

'In addition to the pre-placement medical examination annual regular medical examination should be carried out.'

(CHD 8)

Reprography Unit, BIS, New Delhi, India

Indian Standard

CODE OF SAFETY FOR METHYL ETHYL KETONE

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(*Continued on page* 2)

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(*Continued on page* 9)

Indian Standard
CODE OF SAFETY FOR METHYL ETHYL KETONE

0. FOREWORD

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 17 August 1987, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

0.2 Methyl ethyl ketone is used as solvent for variety of resinous materials, such as vinyl films, glyptal resins, adhesives, printing inks, lacquers, lubricant oil, refining and cleaning fluids. It is used as a catalyst carrier, in vegetable oil extraction processes, in preparation of flavours, antioxidants, perfumes, in the manufacture of *n* amyl ketone and methyl ethyl ketone peroxides.

0.3 In the preparation of this code, considerable assistance has been derived from the following publications.

a) Dangerous Properties of Industrial Materials, third Edition, by N. Irving Sax, Reinhold Publishing Corporation, 1957.

b) Material Safety Data Sheet (No. 303) Published by Materials Information Service, General Electric Company USA 1979.

c) Manual for Handling and Disposal with Toxicity and Hazard Data. Published by International Technical Information Institute, Japan. 1981.

1. SCOPE

1.1 This standard describes properties of methyl ethyl ketone, the nature of hazards associated with it and essential information on storage, handling, packing, labelling, disposal of waste, cleaning of spillages, training of personnel, personal protective equipment and first aid.

1.1.1 This code, however, does not deal with the specifications for design of buildings, chemical engineering plants, storage vessels and equipment for operations control.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 4155-1966* and IS : 4167-1981† shall apply.

3. PROPERTIES

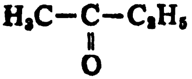
3.1 General Information — Methyl ethyl ketone is a colourless, mobile, volatile liquid with acetone type odour. It is flammable liquid with dangerous risk of fire and explosion, if not properly handled.

3.1.1 *Common Name* — MEK

3.1.2 *Chemical Name* — Methyl ethyl ketone, 2-butanone

3.1.3 *Empirical Formula* — C_4H_8O

3.1.4 *Structural Formula* —



$$H_3C-\underset{\underset{O}{\|}}{C}-C_2H_5$$

3.1.5 *Molecular Weight* — 72·12

3.2 Physical Properties

3.2.1 *Description, Colour, Odour, Physical State* — Methyl ethyl ketone is a colourless, transparent liquid with acetone like odour. The technical grade may have slight yellowish tinge.

3.2.2 *Boiling Point (at 1 atm)* — 80°C

3.2.3 *Specific Gravity* — (20/20°C) — 0·806 15

3.2.4 *Vapour Pressure (at 25°C)* — 100 mm of mercury

3.2.5 *Miscibility / Solubility in Common Solvents* — It is soluble in water and miscible with ethanol and ether.

3.2.6 *Vapour Density* — 2·41

3.3 Chemical Properties

3.3.1 *Reactivity* — Methyl ethyl ketone, with a strong oxidizing agent, can cause spontaneous ignition and violent reaction. Its oxidation in air can give oxides of carbon and nitrogen. Direct oxidation can lead to peroxide formation. It undergoes reactions typical of carbonyl groups. It condenses with variety of reagents. Methyl ethyl ketone reacts violently with certain transition metal oxides, for example, chromium oxide.

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*Glossary of terms relating to chemical and radiation hazards and hazardous chemicals.

†Glossary of terms relating to air pollution (*first revision*).

3.3.2 *Stability at High Temperature*

Autoignition temperature = 516°C

3.3.3 *Light Sensitivity* — No

3.4 Fire and Explosion Hazard Properties

3.4.1 *Flash Point* (*Closed-up*) — (—) 6·7°C

3.4.2 *Flammability* — Lower flammable limit in air 1·8 percent by volume and upper flammable limit in air 10·0 percent by volume. Classified as flammable.

3.5 Corrosion Properties — It has no corrosion properties.

4. HEALTH EFFECTS AND TOXICITY INFORMATION

4.1 General

4.1.1 PEL (TLV) — 200 ppm (590 mg/m^3)

TDL Oral — LD$_{50}$: 3400 mg/kg

STEL — 300 ppm (885 mg/m^3)

4.2 Route of Entry — Inhalation, absorbtion through skin.

4.3 Health Effects — Methyl ethyl ketone is neither highly toxic nor it exhibits cumulative toxological properties. It is slightly more toxic than acetone. Inhalation of vapours over prolonged periods may irritate the mucous membrane and cause nausea and eventually loss of consciousness.

4.3.1 *Eyes* — Eye contact causes irritation and burning sensation of the eyelids.

4.3.2 *Ingestion* — Ingestion causes irritation to the digestive tract. Larger quantities (25 g) can cause narcosis.

4.3.3 *Skin Contact* — It can be absorbed through skin which defats and irritates the skin. When methyl ethyl ketone is mixed with normal hexane, it causes synergistics effect.

4.3.4 *Medical Monitoring* — Provide regular medical monitoring, including blood cell count of those exposed to this material in the work place.

5. PERSONAL PROTECTIVE EQUIPMENT

5.1 Personal protective equipment should include general purpose breathing apparatus, rubber gloves and protective clothing to avoid contact with liquid. Safety goggles or face shields should be used to prevent splashing of the liquid into the eyes.

6. STORAGE, HANDLING, LABELLING AND TRANSPORTATION

6.1 Storage — Storage under roof is preferable in all seasons. The drums should be tightly closed and should not be exposed to sources of heat such as walls of boiler room and kitchen. Storage place should be well ventilated and provided with fire-proof electrical fittings and spark resistant tools. Do not store methyl ethyl ketone near strong oxidizing agents. 'NO SMOKING' sign should be displayed in the storage area.

6.2 Handling — Wear neoprene rubber gloves, protective clothing and face shield while handling this material. Use general purpose breathing apparatus.

6.3 Labelling

6.3.1 Use of hazard warning symbols/labels in plant area are recomended;

6.3.2 Cautionary and warning notice may also be displayed :

NO SMOKING

NO NAKED FLAME

AVOID SPILLAGE

USE PERSONAL PROTECTIVES

6.3.3 Information on labels :

a) Name of the material,
b) Danger — vapour hazardous/toxic,
c) Avoid breathing, and
d) Flammable

6.4 Transport — Follow code symbols for labelling of dangerous goods according to Fig. 5 of IS : 1260 (Part 1) - 1973* and follow safety code for transport dangerous goods as per Government regulation.

---

*Pictorical markings for handling and labelling of goods : Part 1 Dangerous goods.

6.4.1 During shipping in drums, the material may have to be stored. Follow all instructions of storage given under 6.1.

7. SPILLAGE/LEAKAGE AND WASTE DISPOSAL

7.1 Spills and Leakages

7.1.1 If spills and leaks occur, shut off all sources of ignition or remove them from the area as early as possible. Only persons provided with adequate personal protective equipment should remain in the area.

7.1.2 Spills, unless very large, should be absorbed on paper or other absorbent material.

7.1.3 Scrape up with a non-sparking scoop and place in a covered metal container for disposal. Those involved in clean up should use protective equipment. Dispose of the scrap by burning in a remote open pit or depositing in a sanitary land-fill. Do not dump the material down the sewer.

7.1.4 Material from a leaky container should be carefully transferred to another suitable container. During such transfer, all sources of ignition must be kept away from the area.

7.1.5 In the event of a leak in a tank car which cannot be readily repaired by simple adjustments or tightening of the fittings, the supplier should be telephoned or wired immediately for instructions. The area around the tanker should be evacuated and only properly protected personnel should be allowed to enter the area.

7.1.6 Clothings wet with methyl ethyl ketone should be removed immediately and body washed with soap and water. The clothing should not be used again until thoroughly cleaned and dry.

7.2 Waste Disposal

7.2.1 All relevant regulations of local and State Authorities for prevention and control of pollution should be observed.

7.2.2 Water contaminated with methyl ethyl ketone should be sent for effluent treatment before discharging to the river or creek.

7.2.3 Best way to dispose of the methyl ethyl ketone waste is by incineration in a furnace.

8. FIRE PREVENTION AND FIRE FIGHTING

8.1 Preventing Fire Hazard — Fire can be prevented if the material is kept away from heat or flame. The fire hazard can also be avoided by preventing mixing of oxidizing materials with methyl ethyl ketone and using non-sparking tools near this solvent.

8.2 Types of Extinguishers to be Used — Foam dry chemical powder and carbon dioxide can be used to extinguish the flame. Water spray is ineffective for extinguishing, but may be used to keep fire exposed containers cool.

9. TRAINING AND HEALTH MONITORING

9.1 Training and Education — Persons handling or working on plant involving methyl ethyl ketone shall have training such that they can be expected to carry out their jobs effectively and safely. They should be familier with accepted method of handling and should be appraised of the use of protective equipment for safe handling. During instructions, stress should be given that persons know the hazards due to eye contacts, skin contacts, inhalations and ingestion. All persons should be familiar with the location of alarm boxes, first-aid boxes, fire extinguishers and personal protective equipment including the use of breathing apparatus.

9.1.1 Safety in handling methyl ethyl ketone depends, to a great extent, upon the effectiveness of employees education, proper safety instructions, intelligent supervision and the use of safe equipment.

9.2 Health Monitoring

9.2.1 *Pre-employment Medical Examination* — This is required for employees who would be exposed to methyl ethyl ketone. Preclude from exposure those individuals with diseases of the skin, blood and central nervous system.

10. FIRST AID

10.1 Inhalation — Remove victim to fresh air. If required, use artificial respiration to restore breathing. Get immediate medical attention.

10.2 Skin Contact — Wash area of contact with soap and water. Clothing wetted with methyl ethyl ketone should be immediately removed. If irritation persists, get medical attention.

10.3 Eye Contact — Immediately wash with plenty of water including under the eyelids. If irritation persists, get medical attention.

10.4 Ingestion — If victim is conscious, give 3 glasses of water or milk and induce vomitting. Get medical attention as soon as possible.

Caution : Nothing should be given by mouth to an unconscious patient.

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 $kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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